Dec. 6, 1966 J. W. SCHER 3,289,959

MATERIAL FEED CONTROL DEVICE

Filed May 4, 1964 2 Sheets-Sheet 1

Fig. 1.

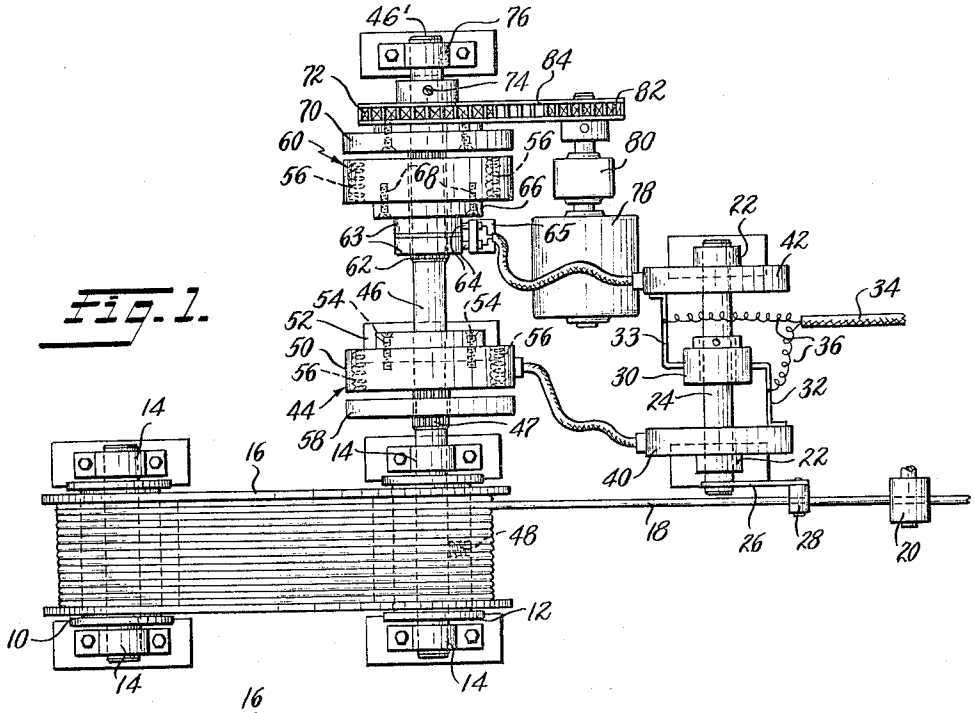
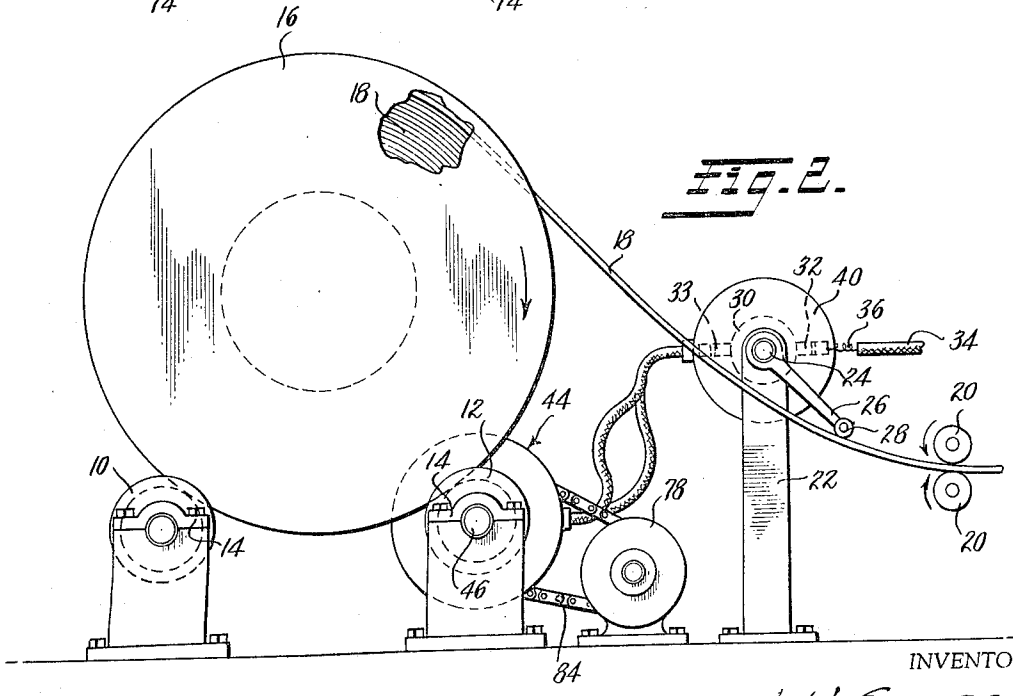


Fig. 2.



INVENTOR
J. W. SCHER

BY

ATTORNEY

United States Patent Office

3,289,959

Patented Dec. 6, 1966

3,289,959

MATERIAL FEED CONTROL DEVICE

Joseph William Scher, Short Hills, N.J., assignor to Weber & Scher Mfg. Co., Inc., a corporation of New Jersey

Filed May 4, 1964, Ser. No. 364,495

8 Claims. (Cl. 242—45)

This invention relates to the control of the pay-off of material from a source of supply and in particular to the control of the rate of said pay-off so that the tension of said material between the source of supply and a material feed device remains substantially constant. From another aspect, the invention relates to the feeding of material wherein a pay-off reel rotates at a speed dependent on the pull on the material so as to maintain constant slack or a catenary between the material pulling device and the pay-off reel.

It is an object of this invention to provide a compact inexpensive mechanism which senses the slack in the material and alternately or simultaneously applies both a driving force and a braking force to a part which effects the drive of the pay-off reel. More specifically, it is an object of this invention to provide in the drive mechanism between a motor and the reel which pays off the material, pairs of electromagnetic clutches one of which provides a driving force to the drive mechanism and the other of which applies a braking force to the drive mechanism, both electromagnet clutches operating concurrently and with inversely proportional effects.

Other objects will become apparent after a consideration of the following specification when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a plan view of a system involving the invention.

FIG. 2 is a side view of FIG. 1.

FIG. 3 is an elevational view showing the relationship of parts on a driving roller and

FIG. 4 is an elevational view showing how the material sensing mechanism and parts associated therewith are supported.

Now referring more specifically to the drawings, at 10 and 12 are indicated a pair of reel supporting rollers, 10 being an idler roller and 12 being a driving roller for the reel. These rollers are suitably supported in bearings 14 and they both support the reel 16 which has wound thereabout material to be paid off, the material here being indicated as a wire 18, although it is obvious that the material being paid off could be a cable, sheet material or similar running lengths. This wire is drawn from off the reel by suitable mechanism such as a pair of rolls 20, one or both of which may be positively driven, as is conventional in the art. Intermediate the reel 16 and the rolls 20 is a slack sensing element, the same comprising a pair of spaced standards 22 in the upper ends of which there is mounted a dancer shaft 24, said shaft having affixed thereto, at one end thereof, a dancer arm 26. At the free end of the arm is rotatably mounted a sensing roller 28 bearing against the upper surface of the wire 18. Rigidly secured to the dancer shaft is a hub 30, suitably insulated from the shaft, said hub having affixed thereto two rheostat arms 32 and 33. Current from a direct current line 34 is fed to the arms in any suitable manner, as by pigtail connections 36 to the rheostat arms.

Fixedly secured on the standards 22, as by bolts 39, is a pair of rheostats 40 and 42, one on each standard. Said rheostats surround and freely rotatably accommodate the shaft 24. The rheostats and arms are so connected into the circuit that as the one rheostat increases in resistance the other rheostat decreases in resistance in corresponding proportion.

In series with the rheostat 40 and the opposite side of the direct current line is a magnetic brake member 44 freely surrounding a rotatable shaft 46, said shaft being fixedly secured within the drive roller 12, as by set screws 48, only one of which is shown. Said magnetic member comprises a circular plate 50 affixed to a standard 52 as by screws 54. The plate embodies a plurality of magnetic coils 56 which when energized will attract a magnetically permeable circular plate 58 splined on the shaft 46, the splines being indicated at 47. Since brake member 44 is fixed against rotation while plate 58 is splined on the shaft 46 for rotation therewith, a braking force will be imposed on the shaft 46 and the drive roller 12 whenever the rheostat 40 is energized, the degree of braking force varying with the angular position of the dancer arm 26 and the rheostat arm 32 coupled for movement therewith.

The rheostat 42 has in series therewith and the opposite side of the direct current line a magnetic drive member 60, said member 60 being rotatable with the shaft 46 but slidable therealong as by means of a splined connection 62 between the member 60 and the shaft 46. Said member 60 has therewithin coils 56 similar to the coils in the magnetic brake member 44, these coils being connected by a pair of suitable slip rings 63 and brushes 64, suitably supported as at 65, to the rheostat 42, the slip rings being insulated from one another and held to the drive member by any suitable means such as a supporting plate 66 and screws 68. Cooperating with the magnetic drive member is a circular permeable plate 70, said plate being fixed for rotation with a driven sprocket 72 and both the plate and sprocket being secured to a motor driven stub shaft 46′ rotatable with respect to the shaft 46, as by set screws 74. The shafting 46, 46′, in addition to being supported by the bearings 14, may be supported by an additional bearing 76 located near the end of the stub shaft 46′ adjacent to the driven sprocket 72. As the resistance of the rheostat 42, decreases, the current in the magnetic coils in the member 60 increases, thus attracting the permeable plate 70 with greater force and applying a greater torque to the shaft 46 thereby tending to drive the roller 12 at a faster rate to pay off the wire 18 at a faster rate. The drive to the driven sprocket 72 is effected by a continuous drive connection from a motor 78, this drive connection, if desired, being through a gear reducing mechanism 80, such as A Reeves' transmission, a drive sprocket 82 and a roller chain 84. Obviously if the motor 78 be a low speed motor, the gear reduction mechanism 80 may not be necessary. Preferably the motor 78 is of an asynchronous A.C. torque type so as not to stall under the action of the brake mechanism on the shaft 46.

It is therefore apparent that when the pay-off reel rotates at a speed which is insufficient to supply the rolls 20 with wire 18 and at a speed which is insufficient to provide a proper loop between the reel and the rolls 20, the dancer arm 26 will oscillate, moving with it the shaft 24 and hub 30, thereby causing the arm 32 of rheostat 40 to move in a direction to increase the resistance in the rheostat 40 and thereby decrease the braking force of the member 44 on the plate 58. At the same time the arm 33 associated with rheostat 42 will cause the decrease of resistance of the rheostat 42 at the same rate that the resistance of rheostat 40 is increasing and cause a greater torque to be exerted by the magnetic drive member 60 on the permeable plate 70. Since the magnetic forces exerted by plates 44 and 60 on the permeable plates 58 and 70 when both magnetic clutches are fully energized are the same, and when both clutches are essentially alike except for the mountings of the parts, the application of braking force and driving force to the shaft 46 will be inversely proportioned to each other

means serially interconnecting one of the rheostats with a source of direct current power and the magnetic brake member, and means serially interconnecting the second rheostat with the magnetic drive member and the source of power, and an asynchronous A.C. torque motor having a positive drive connection with said motor driven member.

6. A feed control device for feeding off running lengths of wire from a reel, said reel having the wire wound thereabout, said device comprising a driving roller, means for driving said driving roller comprising a shaft to which said driven roller is fixedly secured, a motor driving member rotatable with respect to said shaft, a magnetically permeable plate fixedly secured to said motor driven member, a magnetically energized drive member slidably mounted on said shaft and rotatable therewith adapted to be magnetically coupled to said permeable plate, a slack sensing means comprising a dancer shaft having bearings supporting the dancer shaft for rotation, said dancer shaft having a dancer arm affixed thereto, the free end of said dancer arm having means engaging the wire to sense the slackness thereof, a pair of rheostats surrounding said dancer shaft and in which said dancer shaft is freely oscillatable, said rheostats being fixedly mounted on respective bearings, a pair of rheostat arms affixed to said dancer shaft and operative to increase the resistance of one of said rheostats while simultaneously decreasing the resistance of said other rheostat, a fixed magnetic brake member, a second permeable plate splined to the shaft and opposite the fixed magnetic brake member, means serially interconnecting one of the rheostats with a source of direct current power and the magnetic brake member, means serially interconnecting the second rheostat with the magnetic drive member and the source of power and an asynchronous A.C. torque motor having a positive drive connection with said motor driven member.

7. A feed control device for feeding a running length of material, said device including a drive mechanism for paying off said material from a reel and a sensing device for sensing the tension of the material as it leaves the reel, said drive mechanism including shafting mounting a variably effective brake having a normally stationary element and a cooperating member rotatable with the shafting and a variably effective drive member

having a driving element adapted to be driven by a power means and a second cooperating driven element fixed for rotation with the portion of the shafting driving the reel, said sensing device controlling a pair of control elements and means under control of said control elements for simultaneously causing the effectiveness of the brake and drive member to vary in opposition to one another whereby, at times, both the brake and drive means are operative on the shafting.

8. A feed control device for feeding a running length of material, said device including a drive mechanism for paying off said material from a reel and a sensing device biased against a surface of the material being paid off for sensing the tension of the material as it leaves the reel, said drive mechanism including shafting, said shafting mounting a variably effective brake having a normally stationary element and a cooperating member rotatable with the shafting and a variably effective drive member having a driving element adapted to be driven by a power means and a cooperating element fixed for rotation with a portion of the shafting driving the reel, said sensing device operating a pair of control elements, and means under control of said control elements for simultaneously causing the effectiveness of the brake and drive member to vary in opposition to one another whereby, at times, both the brake and drive means are operated on the shafting.

References Cited by the Examiner

UNITED STATES PATENTS

1,343,910	6/1920	Evans	242—75.51
2,271,049	1/1942	Treckman et al.	242—45
2,317,290	4/1943	McIluried.	
2,401,982	6/1946	Springhorn.	
2,675,190	4/1954	Wiig	242—75.5
2,816,758	12/1957	Danly	242—75.5

FOREIGN PATENTS

1,082,126	6/1954	France.

FRANK J. COHEN, *Primary Examiner.*

STANLEY N. GILREATH, *Examiner.*

W. S. BURDEN, *Assistant Examiner.*

Dec. 6, 1966 J. K. WILLIS 3,289,960

TAPE GUIDE AND STORAGE DEVICE

Filed Aug. 19, 1964 4 Sheets-Sheet 1

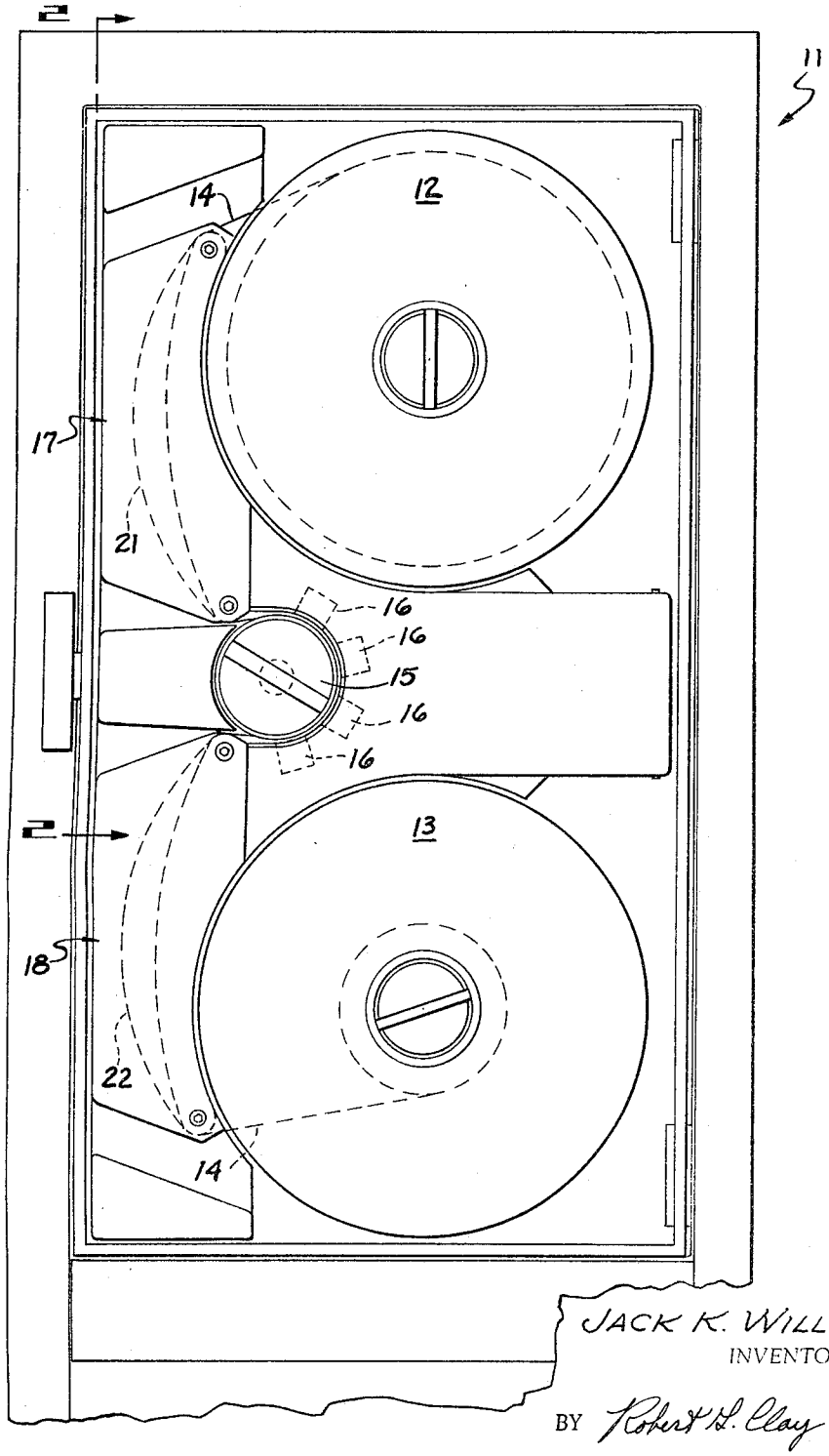


FIG. 1

JACK K. WILLIS
INVENTOR.

BY Robert L. Clay

ATTORNEY